AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

1. (previously presented) A method of measuring an amount of an organic substance contained within a biological sample utilizing a detection system, comprising:

(a) transmitting incoherent infrared radiation through a sample;

(b) detecting the intensity of the transmitted radiation with an infrared detector;

(c) generating an electrical signal in response thereto;

(d) receiving the electrical signal with a signal processor configured to process the electrical signal with a quantification algorithm; and

(e) processing the electrical signal to provide a measure of the amount of the organic substance contained within the sample; wherein,

(i) one or more reference samples, each containing a known amount of the organic substance, are measured thereby calibrating the detection system,

(ii) the biological sample and the reference sample each have an infrared absorption spectrum which includes a set of n selected wavelength regions,

(iii) up to n-1 of the wavelength regions each substantially correspond to an absorption band of the organic substance, and

(iv) at least one of the wavelength regions substantially corresponds to a reference absorption band.

2. (previously presented) The method of claim 1, wherein the organic substance is glucose.

3. (previously presented) The method of claim 1, further comprising collecting the biological sample from a mammal.

4. (previously presented) The method of claim 1, wherein:

the quantification algorithm of (d) includes dividing an integrated absorbance value of one of the wavelength region substantially corresponding to an absorption band of the

organic substance by an integrated absorbance value of one of the wavelength regions substantially corresponding to a reference absorption band, wherein at least one reference wavelength band is contained in the wavelength regions in which said organic substance does not substantially absorb electromagnetic radiation.

5. (previously presented) The method of claim 4, wherein:

the quantification algorithm of (d) further includes dividing an integrated absorbance value of a second wavelength region substantially corresponding to an absorption band of the organic substance by the integrated absorbance value of the wavelength region substantially corresponding to the reference absorption band.

6.- 10. (Canceled)

11. (previously presented) The method of claim 3, wherein the mammal is a human.

12 - 15. (Canceled)

16. (previously presented) The method of claim 1, wherein:

the set of n selected wavelength regions are within a range from about 7 to 11 microns [1400 cm^{-1} to about 950 cm^{-1}].

17. (previously presented) A method of measuring a concentration of an organic substance contained within a biological fluid, comprising:

(1) calibrating a detection system by the steps of:

(a) detecting, with an infrared detector, the transmittance of n selected wavelength bands of incoherent infrared radiation through a reference fluid,

(b) generating an electrical signal in response thereto,

(c) receiving the electrical signal with a signal processor configured to process the electrical signal with a mathematical model, and

(d) processing the electrical signal to calibrate the detection system;

(2) utilizing the detection system to give a measure the concentration of the organic substance contained within the biological fluid.

18. (previously presented) The method of claim 17, wherein the organic substance is glucose.

19. (previously presented) The method of claim 18, wherein:

the mathematical model utilized to process the electrical signal uses the equation:

$C_g = P_0 + P_1 IAR_{\lambda,1} + P_2 IAR^2_{\lambda,1}$

wherein (i) n = 2, (ii) C_g is the mean-centered concentration of glucose in the fluid measured using methods other than IR absorption, (iii) P_i are calibration constants, and (iv) $IAR_{\lambda,1}$ is a mean-centered integrated absorbance ratio of the selected wavelength band to the reference wavelength band.

20. (previously presented) The method of claim 18, wherein:

the mathematical model utilized to process the electrical signal uses the equation:

$C_g = P_0 + P_1 IA_{\lambda,1} + P_2 IA_{\lambda,2} + P_3 IA^2_{\lambda,1} + P_4 IA^2_{\lambda,2} + P_5 IA_{\lambda,1} IA_{\lambda,2}$

wherein (i) n = 2, (ii) C_g is the mean-centered concentration of glucose in the fluid measured using methods other than IR absorption, (iii) P_i are calibration constants, and (iv) $IA_{\lambda,1}$ is the mean centered integrated absorbance for the selected glucose wavelength band and $IA_{\lambda,2}$ is the mean centered integrated absorbance for the selected reference wavelength band.

21. (previously presented) The method of claim 18, wherein:

the mathematical model utilized to process the electrical signal uses the equation:

$C_g = P_0 + P_1 IAR_{\lambda,1} + P_2 IAR_{\lambda,2} + P_3 IAR^2_{\lambda,1} + P_4 IAR^2_{\lambda,2} + P_5 IAR_{\lambda,1} IAR_{\lambda,2}$

wherein (i) n = 3, (ii) C_g is the mean-centered concentration of glucose in the fluid measured using methods other than IR absorption, (iii) P_i are calibration constants, and (iv) $IAR_{\lambda,j}$ is a mean-centered integrated absorbance ratio of the selected wavelength band to the reference wavelength band.

22. (previously presented) The method of claim 18, wherein:

the mathematical model utilized to process the electrical signal uses the equation:

$$C_g = P_0 + P_1 IA_{\lambda,1} + P_2 IA_{\lambda,2} + P_3 IA_{\lambda,3} + P_4 IA^2_{\lambda,1} + P_5 IA^2_{\lambda,2} + P_6 IA^2_{\lambda,3} + P_7 IA_{\lambda,1} IA_{\lambda,2} + P_8 IA_{\lambda,2} IA_{\lambda,3} + P_9 IA_{\lambda,1} IA_{\lambda,3}$$

wherein (i) n = 3, (ii) C_g is the mean centered concentration of glucose in the fluid measured using methods other than IR absorption, (iii) P_i are calibration constants, and (iv) $IA_{\lambda,j}$ is the mean centered integrated absorbance for band j.

23. (previously presented) A method of measuring an amount of an organic substance contained within a biological sample having an infrared absorption spectrum which includes a set of n absorption regions, wherein up to n-1 of the absorption regions are absorbed by the organic substance and at least one of the absorption regions, a reference absorption region, does not correspond to the absorption regions of the organic substance, comprising:

(a) illuminating the biological sample with infrared electromagnetic radiation, wherein the infrared electromagnetic radiation is transmitted through the sample;

(b) selecting n-1 or less absorption bands from the absorption regions absorbed by the organic substance;

(c) selecting 1 or more reference wavelength bands from the absorption regions in which the organic substance does not absorb;

(d) detecting the intensity of the transmitted electromagnetic radiation at the n absorption bands;

(e) generating one or more electrical signals in response to detecting the intensity of the n absorption bands;

(f) receiving the electrical signals with a signal processor configured to process the electrical signals with a quantification algorithm; and

(g) processing the electrical signals with the quantification algorithm so as to provide a measurement of the amount of the organic substance contained within the biological sample.

24. (Canceled)

25. (previously presented) The method of claim 23, wherein n is equal to or less than nine.

26. (previously presented) A method of measuring an amount of an organic substance contained within a biological sample, the organic substance having an infrared absorption spectrum which includes a set (n) of wavelength regions, wherein up to n-1 of the wavelength regions each substantially correspond to an absorption band of the organic substance and at least one of the wavelength regions corresponds to a reference absorption band, comprising:

(a) calibrating a detection system with a reference sample;

(b) illuminating the sample with mid infrared electromagnetic radiation;

(c) filtering the electromagnetic radiation such that only radiation which corresponds to the n wavelength regions reaches detector;

(d) detecting with the detector the intensity of the transmitted radiation.

27. (previously presented) A method of measuring an amount of an organic substance contained within a biological sample, the organic substance having an infrared absorption spectrum which includes a set (n) of wavelength regions, wherein up to n-1 of the wavelength regions substantially correspond to an absorption band of the organic substance and at least one of the wavelength regions corresponds to a reference wavelength band, comprising:

(a) calibrating a detection system with a set of reference samples;

(b) illuminating the biological sample with mid infrared electromagnetic radiation, wherein the infrared electromagnetic radiation includes (i) one or more discrete wavelength bands selected by filtering the electromagnetic radiation to correspond with the wavelength absorption bands of the organic substance contained within the biological sample and (ii) one or more discrete reference wavelength bands selected by filtering the electromagnetic radiation to correspond with a wavelength region not substantially absorbed by the organic substance contained within the biological sample;

(c) detecting with the detection system the intensity of the infrared electromagnetic radiation transmitted through the biological sample; and

(d) processing with a mathematical model the intensity of transmitted infrared electromagnetic radiation of the discrete absorption bands corresponding to the organic substance absorption bands and the reference absorption bands.

28. (previously presented) A method for determining a patient glucose level, comprising:

(1) obtaining a sample of cell-free blood-based body fluid in a sample container having a pre-defined measurement path;

(2) passing infrared radiation through the sample and sample container over the pre-defined measurement path to an infrared detector, wherein the infrared detector measures the intensity of radiation at less than 10 discrete wavelength bands, wherein:

(a) at least one of the wavelength bands corresponds to an absorption band of glucose,

(b) at least one of the wavelength bands does not correspond to an absorption band of glucose,

(c) each wavelength band has a bandwidth of at least 140 nm, and

(d) the infrared radiation is modulated;

(3) detecting the infrared radiation using the infrared detector;

(4) generating one or more electrical signals in response to detecting the infrared radiation; and

(5) calculating the patient glucose level by utilizing a calibration curve established with a series of samples with known glucose concentrations.

29. (previously presented) The method of claim 28, wherein the body fluid is plasma, serum, or interstitial fluid.

30. (previously presented) The method of claim 29, wherein the body fluid is interstitial fluid.

31. (previously presented) The method of claim 28, wherein the sample is transported from a source location at or inside a patient body to the sample container.

32. (previously presented) The method of claim 30, wherein the source location is at an implanted needle site, a subcutaneous membrane surface, or a skin surface subjected to ionoporation, microporation, or reverse ionophoresis.

33. (previously presented) The method of claim 30, wherein the interstitial fluid is filtered to remove proteins prior to passing the infrared radiation through the sample.

34. (previously presented) The method of claim 33, further comprising removing at least 80% of the proteins prior to passing the infrared radiation through the sample.

35. (previously presented) The method of claim 34, wherein removing at least 80% of the proteins comprises removing at least 96% of the proteins prior to passing the infrared radiation through the sample.

36. (previously presented) The method of claim 35, wherein the removing at least 96% of the proteins comprises removing at least 98% of the proteins prior to passing the infrared radiation through the sample.

37. (previously presented) The method of claim 29, further comprising passing the body fluid through a filter having a molecular weigh cut off in a range from 10 kD to 100 kD prior to passing the infrared radiation through the sample.

38. (previously presented) The method of claim 29, wherein the passing the body fluid further comprises passing the body fluid through a filter having a molecular weigh cut off in a range from 10 kD to 40 kD prior to passing the infrared radiation through the sample.

39. (previously presented) The method of claim 29, wherein the passing the body fluid further comprises passing the body fluid through a filter having a molecular weight cut off in a range from 10 kD to 25 kD prior to passing the infrared radiation through the sample.

40. (previously presented) The method of claim 28, wherein the measurement path has a length in a range from 5 to 60 microns.

41. (previously presented) The method of claim 40, wherein the measurement path has a length in a range from 15 to 35 microns.

42. (previously presented) The method of claim 28, wherein two wavelength bands corresponding to absorption bands of glucose are selected so that the first glucose absorbance band has a first absorbance ratio for an interfering substance potentially present in the body fluid and the second glucose absorbance band has a second absorbance ratio for the interfering substance, wherein the first and second absorbance ratios are different from each other.

43. (previously presented) The method of claim 42, wherein a third wavelength band corresponding to a glucose absorbance band is selected so that the third glucose absorbance band has an absorbance ratio for a second interfering substance potentially present in the body fluid.

44. (previously presented) The method of claim 42, wherein the interfering substance is lactic acid, a lactate salt, ascorbic acid, an ascorbate salt, mannitol, acetaminophen, ethanol, or a phosphate salt.

45. (previously presented) The method of claim 43, wherein the interfering substance is lactic acid or a lactate salt and the second interfering substance is ascorbic acid, an ascorbate salt, mannitol, acetaminophen, ethanol, or a phosphate salt.

46. (previously presented) The method of claim 33, wherein the wavelength bands are selected to be within or to overlap ranges selected from 1090 cm^{-1} to 1075 cm^{-1} [9.174 to 9.302 microns], 1175 cm^{-1} to 1137 cm^{-1} [8.511 to 8.795 microns], and 1180 cm^{-1} to 1170 cm^{-1} [8.475 to 8.547 microns].

47. (previously presented) The method of claim 33, wherein the wavelength bands are selected to be within or to overlap ranges selected from a band having a center at 1261 cm^{-1} or a wavelength of 7.930 microns and a bandwidth of 170 nm from 1275 cm^{-1} to 1248 cm^{-1} [7.845 to 8.015 microns], a band having a center at 1073 cm^{-1} or a wavelength of 9.320 microns and a bandwidth of 400 nm from 1096 cm^{-1} to 1050 cm^{-1} [9.120 to 9.520 microns], and a band having a center at 1200 cm^{-1} or a wavelength of 8.330 microns and a bandwidth of 140 nm from 1211 cm^{-1} to 1190 cm^{-1} [8.260 to 8.400 microns].

48. (previously presented) The method of claim 30, wherein the wavelength bands are selected to be within or to overlap ranges selected from a band having a center at 1040 cm^{-1} or a wavelength of 9.62 microns and a bandwidth of 200 nm from 1050 cm^{-1} to 1029 cm^{-1} [9.52 to 9.72 microns], a band having a center at 1085 cm^{-1} or a wavelength of 9.22 microns and a bandwidth of 200 nm from 1096 cm^{-1} to 1073 cm^{-1} [9.12 to 9.32 microns], a band having a center at 1160 cm^{-1} or a wavelength of 8.62 microns and a bandwidth of 200 nm from 1174 cm^{-1} to 1147 cm^{-1} [8.52 to 8.72 microns], a band having a center at 1109 cm^{-1} or a wavelength of 9.02 microns and a bandwidth of 200 nm from 1121 cm^{-1} to 1096 cm^{-1} [8.92 to 9.12 microns], and a band having a center at 1364 cm^{-1} or a wavelength of 7.33 microns and a bandwidth of 200 nm from 1383 cm^{-1} to 1346 cm^{-1} [7.23 to 7.43 microns].

49. (previously presented) The method of claim 28, wherein the fluid is interstitial fluid, wherein the interstitial fluid is transported from a source location at or inside a patient body to a measurement location outside a patient body and the measurement container is present at the measurement location, wherein the interstitial fluid is passed through a filter having a molecular weight cut off in a range from 10 kD to 40 kD prior to passing the infrared signal through the sample, wherein the measurement path has a length in a range from 20 to 30 microns, and wherein the post-absorbance signal contains glucose absorbance date from a region from 8.3 to 10.3 microns.

50. (previously presented) The method of claim 28, wherein the infrared radiation is modulated by varying the current, the voltage, or the frequency provided to the device that generates the infrared radiation.

51. (previously presented) The method of claim 28 wherein the infrared radiation is modulated by the periodic insertion of an infrared blocking material that has alternative windows formed from transparent and blocking (opaque) sections.

52. (previously presented) The method of claim 50 further comprising performing a second modulation technique, wherein the second modulation technique consists of

modulating the infrared radiation by the periodic insertion of an infrared blocking material that has alternative windows formed from transparent and blocking (opaque) sections.

53. (previously presented) The method of claim 28, wherein the infrared radiation is modulated by the periodic insertion of an infrared blocking material that has alternative windows formed from transparent, reference, and blocking (opaque) sections and the infrared radiation is modulated by varying the current, the voltage, or the frequency provided to the device that generates the infrared radiation.

54. (previously presented) The method of claim 50 wherein the infrared radiation is modulated at a frequency from 01. Hz to 10 Hz.

55. (previously presented) The method of claim 54 wherein the infrared radiation is modulated at a frequency of 3 Hz.

56. (previously presented) The method of claim 28, wherein the sample container has a window made from a material selected from the group consisting of: barium fluoride, silicon and zinc selenide.

57. (currently amended) A method for determining a patient glucose level, comprising:

(1) calibrating a detector;

(2) obtaining a sample of a biological fluid in a sample container having a path of defined path length for the transmission of infrared radiation;

(3) emitting radiation from a modulated infrared source, the radiation being a modulated mid infrared radiation;

(4) transmitting the modulated mid infrared radiation through the sample such that the infrared radiation is absorbed by glucose in the sample;

(5) detecting, with a detector configured to detect modulated radiation, radiation corresponding to at least two glucose absorbance bands each having a bandwidth of at least 140 nm and radiation corresponding to at least one reference band and generating an

electrical signal in response to detecting the modulated radiation, wherein the detector uses spectral filtering channels;

(6) receiving the electrical signal with a signal processor configured to process the electrical signal with a quantification algorithm; and

(7) processing the electrical signal with the quantification algorithm, thereby providing a measurement of glucose contained within the sample.

58. (previously presented) The method of claim 57, wherein the mid infrared radiation comprises wavelengths in a range of from 7 to 11 microns [1200 cm^{-1} to 900 cm^{-1}].

59. (previously presented) The method of claim 57, wherein the biological fluid is plasma, serum, or capillary filtrate fluid.

60. (previously presented) The method of claim 59, wherein the biological fluid is capillary filtrate fluid.

61. (previously presented) The method of claim 60, wherein the sample of capillary filtrate fluid is transported from a subcutaneous location to the sample container.

62. (previously presented) The method of claim 59, wherein the capillary filtrate fluid is filtered prior to passing the infrared radiation through the sample.

63. (previously presented) The method of claim 62, wherein the capillary filtrate fluid is passed through an ultrafiltration membrane at a subcutaneous location of the patient.

64. (previously presented) The method of claim 63, wherein the ultrafiltration membrane passes organics having less than 3000 molecular weight.

65. (previously presented) The method of claim 64, wherein the membrane has a molecular weigh cut off of in a range from 10 kD to 40 kD.

66. (previously presented) The method of claim 57, wherein two wavelength bands, corresponding to absorption bands of glucose, are selected so that the first glucose absorbance band has a first absorbance ratio for an interfering substance potentially present in the biological fluid and the second glucose absorbance band has a second absorbance ratio for the interfering substance, wherein the first and second absorbance ratios are different from each other.

67. (previously presented) The method of claim 66, wherein a third glucose absorbance band is selected.

68. (previously presented) The method of claim 66, wherein the interfering substance is lactate.

69. (previously presented) The method of claim 57, wherein the biological fluid is capillary filtrate fluid, the capillary filtrate fluid is transported from a subcutaneous location to the sample container, the capillary filtrate fluid is passed through an ultrafiltration membrane that allows passage of organics of less than 3000 molecular weight and wherein the detected radiation contains glucose absorbance bands in a region from 1200 cm^{-1} to 950 cm^{-1} [7 to 11 microns].

70-88. (Canceled)